IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 7, July 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

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International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007017 |

Real Time Face Mask Detection Method

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ABSTRACT: The emphasis on wearing facemasks has reached an all-time high in light of the most recent Covid eruption. However, it is extremely challenging to enforce the mask regulation, particularly in nations with dense populations. In this study, a face mask identification model is put forth that can identify subjects in a live video feed who are not wearing masks. The system can be set up as part of a network of security cameras. Upon identifying those who aren't wearing masks, it raises an alarm. The model uses a deep learning architecture that was trained on a dataset that included pictures of persons wearing masks and not wearing them, as well as the bounding box coordinates for each face that appeared in each picture.

KEYWORDS: Computer vision, deep learning, face mask detection, SSD

I. INTRODUCTION

A novel coronavirus is a kind that has never before affected people (nCoV). The group of viruses known as coronaviruses (CoV)that are responsible for ailments ranging from colds to deadly infections, like the Middle East,Severe Respiratory Syndrome (MERS) and respiratory syndrome, acute (SARS). In The first coronavirus infection was discovered in December 2019. The patient was located. The spread of COVID-19 since then, all across the world. This disease is putting individuals from around the world in challenging positions Thousands of people receive diseased and perish daily. Almost 512MAs of the date, confirmed cases of infection 6.25M deaths at the time this article was written.The coronavirus is fought using a number of prophylactic .There have been actions taken.

There are various prophylactic measures in place to counteract the coronavirus. The most crucial precautions include washing hands, maintaining a safe distance, donning a mask, and refraining from touching one's eyes, nose, or mouth. Donning a mask is the simplest solution.
The disease COVID-19 is contagious and can be avoided by appropriately donning a face mask. People who keep a close social distance and wear a face mask can contain COVID-19. Unfortunately, many people are not adhering to the recommendations, which is accelerating the infection's spread. Coronavirus can be stopped from spreading by identifying people who are not following the rules and informing the proper authorities.

The purpose of this project is to warn the person who is not wearing a mask by spotting the existence of a face mask on human faces in live streaming video and still images. An picture is first processed by a pre-trained SSD model to identify faces, and the output is then given to a convolutional neural network (CNN), which categorises the faces as "Mask" or "No Mask" and raises an alarm.

II. RELATED WORKS

In[1] In these tough times of COVID-19 it is necessary to build a model that detects people with and without mask in real-time as it works as a simple precautionary measure to prevent the spread of virus. If deployed correctly,this machine learning technique helps in simplifying the work of frontline warriors and saving their lives. A basic Convolutional Neural Network (CNN) model is built using TensorFlow, Keras, Scikit -learn and OpenCV to make the algorithm as accurate as possible. Javascript API helps in accessing webcam for real-time face mask detection. Since Google Colab runs on web browser it can't access local hardware like a camera without APIs.The proposed work contains three stages: (i) pre-processing,(ii) Training a CNN and (iii) Realtimeclassification. The first part is the Pre-

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processing section, which can be"Grayscale Conversion" of RGB image,"image resizing and normalization" to avoid false predictions. Then the proposed CNN,classifies faces with and without masks as the output layer of proposed CNNand no alert system was introduced.
In [2]. Data-driven decision-making uses data-related evidence and insights to guide the decision-making process and verify the plan of action before it is committed. To better handle the epidemic, governments and policy-making institutes have investigated abundant data originating from COVID-19. These data include those related to medicine, knowledge, media, and so on. Based on these data, many prevention and control policies are made. In this survey article, we summarize the progress of data-driven decision-making in the response to COVID-19, including COVID-19 prevention and control, psychological counseling, financial aid, work resumption, and school reopening and no alert system was introduced.
In [3],Covid-19 pandemic has rapidly affected your day-to-day life distrupting the world trade and movements. Wearing a protective face mask has become a new normal. In the near future, many public service providers will ask the customers to wear mask correctly to avail of their services. Therefore, face mask detection has become a crucial task to help global society. This paper presents a simplified approach to achieve this purpose using some basic Machine Learning packages like Tensor-Flow, Keras, OpenCv. The proposed method detects the face from the image correctly and then identifies if it has a mask on it or not. we explore optimized values ofparameters using the sequential Convolutional Neural Network model to detect the presence of mask correctly, without causing over-fitting and no alert system was introduced.

III. PROPOSED ALGORITHM

A. Convolutional Neural Networks (CNN) were employed to produce some cutting-edge results and triumph in renowned competitions. Using kernels to coevolve a signal or a picture is how convolutional layers work charts for gaining points A unit in a point, then chart has ties to the previous subcasteutilising the kernel weights. The Back propagation is used throughout the training phase to acclimatise the kernel weights.
In order to improve specific qualities the input's.

Convolutional layers have less weights to train than thick FC layers, making CNN easier to train and less prone to overfitting because the kernels are shared among all units of the same point charts. Additionally, because the same kernel has coevolved across the entire image, the same point may be located singly thanks to restatement invariance. Using kernels allows for the consideration of neighbourhood data, a helpful source of environmental knowledge. Typically, each brain unit's activity is subject to a non-linear activation function. However, if we stack numerous convolutional layers, the uprooted characteristics get more abstract as depth is added. The early layers emphasise edges and other comparable elements that are then built out in subsequent layers as motifs, corridors, or objects.

B. Single Shot Multibox Detector (SSD), created by Liu et al. for quick multi-class object recognition in pictures, is a single deep neural network [4]. Per feature map point, SSD discretizes the output space of the bounding boxes into a set of default boxes for various aspect ratios and scales. The network calculates scores for each item type that is present in each default box at prediction time, and then it modifies the box to better fit the shape of the object. Additionally, the network combines predictions from several feature maps with various resolutions to naturally handle objects of various sizes. Due to the fact that SSD forgoes proposal formation and following pixel or feature resampling phases, encapsulating all processing in a single step, it is simpler than methods that rely on object proposals.

IV. PSEUDO CODE

1. DATA COLLECTION

Data collection is the first step in developing the Face Mask Detection model. The dataset includes training data on both mask-wearers and non-users. The model will distinguish between those wearing masks and those who are not.

This study uses both data with and without a mask to develop the model. The image is cropped at this stage such that the object's face is the only thing that remains visible.

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The data must then be labelled. The obtained data has been divided into two categories: with a mask and without a mask. The data is sorted into those two groups once it has been tagged.Images were collected from Kaggle data set.

The use of datasets was necessary to collect different scenarios:

- People of different racial and ethnicities
- Masks of different types
- Masks in different positions
- Different Angles

2. IMAGE PRE-PROCESSING

The pre-processing stage comes before the data is trained and tested. Pre-processing involves a number of stages, including shrinking the size of the image, turning the image to an array, and pre-processing input using MobileNetV2. The calibre of the dataset affects a model's accuracy. The initial data cleaning is carried out to remove the flawed images found in the dataset. The photos are reduced in size to a predetermined size to help the computer train more efficiently and produce the best results. The photos are then classified as having masks or not. The pictures array is then converted to a NumPy array for expedited calculation. Additionally, the MobileNetV2 feature is also utilized.

The data augmentation technique is then used to enhance the training dataset's size while simultaneously enhancing its quality. To create many variations of the same image, an image data generator function is used with the proper parameters for rotation, zoom, and horizontal or vertical flip. To prevent over-fitting, the number of training samples has been increased. The trained model becomes more robust and generalised as a result. The entire dataset is then split into training and test data in an 8:2 ratio by randomly selecting photos. In order to aid in accurately identifying the existence of a mask using pictures and video streams in real-time, a three-phase facemask detector was developed.

3. BUILDING THE MODEL

A supervised learning CNN model classifies the trained images into the appropriate classes by recognising significant visual patterns once it has been trained. The main components of the proposed model are TensorFlow and Keras. In this study, the training set comprises 80% of the dataset, and the testing set comprises the remaining 20%. The steps mentioned above are used to pre-process and enrich the supplied image. A 3 x 3 filter, Pooling Layers, and Conv2D layers with ReLu activation functions are present. The fully connected layers are Flatten and Dense. The activation function for the output layer's Dropout layer is softmax, and its rate is 0.5. With more epochs, Adam Optimizer produces better outcomes.

4. TRAINING AND INTERPRETATION

The face detection model is pre-trained using iterations on 224X224 image size. The Single Shot Detector (SSD) framework serves as the foundation for the ResNet-10 architecture used by the DNN face detector.

With the use of a multi-box, the Single Shot Detector uses a single shot to recognise several objects in a photograph. Consequently, it boasts an object detection mechanism that is significantly faster and more precise. We get the quantity of detected faces using the face detection model are then used as input to the face mask detection. model. This face identification model can identify faces in both still images and live video streams. This model uses few resources and runs quickly and accurately overall.

V. SIMULATION RESULTS

The Python application development language was used throughout the simulation, which was run on the 32-bit Windows 10 operating system. The experiment was coded to use the SSD method and the Tensor-flow platform to build and train the model. The laptop computer with an Intel Core i7-8700 CPU clocked at 4.60GHz with 12 M Cache, 16 GB of RAM, and a GTX 1050 graphic card is also used to construct the system. Additionally, data augmentation was used to boost the amount of image data that was gathered throughout the investigation. These methods include

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image rotation and image flipping. The optimizer creates and moulds the model into the most realistic form that is possible by fiddling with the weights.

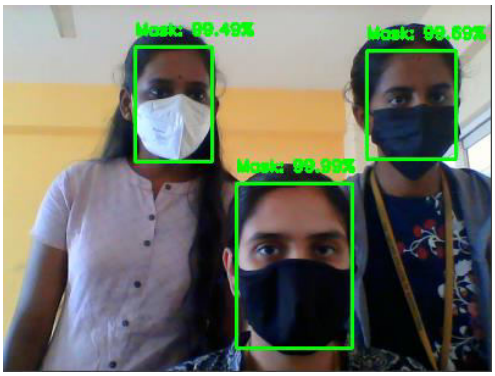

Fig 1: Detected Mask Face

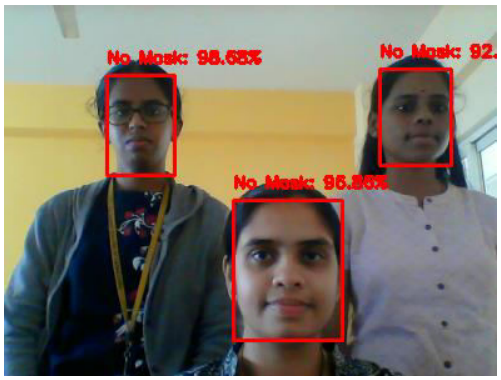

Fig2 : Detected No Mask Face

VI. CONCLUSION AND FUTURE WORK

We now have a face mask detector thanks to the burgeoning of technology and the availability of new trends, which may help improve public healthcare. The architecture, which may be employed in both high- and low-computing environments, uses MobileNet as its backbone. We use transfer learning to adopt weights from a task that is similar to face detection but trained on a much smaller dataset in order to extract more robust features. To determine whether or not individuals were donning face masks, we employed OpenCV, tensor flow, keras, and CNN.

In this pandemic situation, people are more involved in crime by wearing a face mask. This model can detect and recognize the person irrespective of their masked face it may help to reduce crime all over the country.

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Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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